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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,111	07/11/2003	James D.B. Smith	2003P08574US	4106

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Siemens Corporation
Intellectual Property Department
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EXAMINER

FEELY, MICHAEL J

ART UNIT	PAPER NUMBER
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1712

DATE MAILED: 05/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/618,111	SMITH, JAMES D.B.	
	Examiner	Art Unit	
	Michael J. Feely	1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. <u>0505</u> . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____. | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Pending Claims

Claims 1-19 are pending.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The rejection of claims 1-9 and 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US Pat. No. 5,904,984) in view of Cook et al. (US Pat. No. 6,369,183) *stands for the reasons of record*.

Regarding claims 1-9 and 11, Smith et al. disclose: *(1)* an LCT-epoxy polymer (column 2, line 22 through column 5, line 19); *(7)* further comprising a process step of mixing at least one anhydriding agent with said LCT-epoxy polymer (column 5, lines 20-56); *(8)* wherein said anhydriding agent is taken from the group consisting of 1-methylhexahydrophthalic anhydride and 1-methyltetrahydrophthalic anhydride (column 5, lines 35-41); *(9)* wherein said anhydriding agent is approximately 25-45% by weight of said LCT-epoxy polymer (column 5, lines 51-53); and *(11)* wherein said mixture is added to an electrical insulator as coating before curing (Abstract; column 2, lines 22-29; Figure 2).

The composition of Smith et al. also contains inorganic particulate filler, including aluminum-based fillers, to improve the electrical properties of the resin (column 6, lines 45-50).

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However, the teachings of Smith et al. are deficient in that they do not teach: *(1)* a method of making a homogeneous *alumoxane-LCT-epoxy polymer* comprising:

- Mixing at least one boehmite material with the LCT-epoxy resin under conditions to form a uniform dispersion and an essentially complete co-reactivity of the boehmite material with the LCT-epoxy resin;
- Curing the mixture to produce the homogeneous *alumoxane-LCT-epoxy polymer*;
 - Wherein the weight ratio of boehmite material to LCT-epoxy resin is between 3:17 and 13:7 (15-65% boehmite base on combined weight of boehmite and LCT-epoxy resin); and
 - Wherein the *alumoxane-LCT-epoxy polymer* has a dielectric strength of at least 1.2 kV/mil;
 - Wherein the *alumoxane-LCT-epoxy polymer* has a thermal conductivity in the traverse direction of at least 0.50 W/mK and in the thickness direction of at least 0.99 W/mK in an environment of 25°C;

(2) wherein the boehmite material comprises carboxylate-alumoxane; *(3)* wherein the carboxylate-alumoxane is 4-hydroxybenzoate-alumoxane; *(4)* wherein the alumoxane portions of the *alumoxane-LCT-epoxy polymer* is 20-50% by weight; *(5)* wherein the mixing step comprises first pre-heating the LCT-epoxy resin until it is clear; and *(6)* wherein the mixing step further comprises warming until said mixture is clear.

Cook et al. disclose a method of forming hybrid polymers and resins in which at least one component is a chemically modified carboxylate-alumoxane. The carboxylate-alumoxanes are chemically bonded into the polymer backbone through reaction of the appropriate functional

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groups of a polymer precursor with the carboxylate-alumoxane (*see column 1, lines 14-21*). This method is *an alternative to the standard practice of adding filler to resin systems in order to enhance properties*, such as *thermal conductivity*. This method also avoids handling and dispersion problems, including phase separation and agglomeration of the filler in the polymer composite (*see column 1, line 52 through column 2, line 54*). This method can be applied to numerous polymer materials, including epoxy resins. The reaction mechanism can be found in Figure 10. Essentially, Cook et al. disclose: *(1)* a method of making a homogeneous *alumoxane-epoxy polymer* comprising:

- Mixing at least one boehmite material with the LCT-epoxy resin under conditions to form a uniform dispersion and an essentially complete co-reactivity of the boehmite material with the LCT-epoxy resin (column 11, line 52 through column 12, line 51; Figures 10 & 11);
- Curing the mixture to produce the homogeneous *alumoxane-epoxy polymer* (column 11, lines 29-51; Figures 7-9);
 - Wherein the weight ratio of boehmite material to LCT-epoxy resin is between 3:17 and 13:7 (column 14, lines 17-19; Table 1: column 25, lines 55-64);

(2) wherein the boehmite material comprises carboxylate-alumoxane (column 11, line 29 through column 12, line 10); *(3)* wherein the carboxylate-alumoxane is 4-hydroxybenzoate-alumoxane (column 11, line 65); *(4)* wherein the alumoxane portions of the *alumoxane-epoxy polymer* is 20-50% by weight (column 14, lines 17-19; Table 1: column 25, lines 55-64); *(5)* wherein the mixing step comprises first pre-heating the LCT-epoxy resin until it is clear (column 12, lines

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24-51); and (6) wherein the mixing step further comprises warming until said mixture is clear (column 12, lines 24-51).

Cook et al. do not mention the use of LCT-epoxy polymers; however, they disclose, “Although we have demonstrated the formation of alumoxane-epoxy composites using commercial resins such as Dow Chemical’s DER 332, combinations of DER 332 and DER 732, Union Carbide’s ERL (cycloaliphatic resin), and Shell’s EPI-REZ (a waterborne resin system), any commercially available epoxy resin can be used to prepare the carboxylate-alumoxane/epoxy polymer hybrid materials,” (column 12, lines 11-17). In light of this, LCT-epoxy polymers would fall under this umbrella of suitable materials – *see MPEP 2144.07*. Furthermore, one skilled in the art would have been motivated to employ this method in the method of Smith et al. in order to avoid the drawbacks of physically adding filler materials, especially aluminum-based filler materials, to their LCT-epoxy polymer compositions.

Lastly, the combined teachings of Smith et al. and Cook et al. are silent regarding dielectric strength and conductivity of the alumoxane-LCT-epoxy polymers. However, it appears that if one skilled in the art were to apply the technique of Cook et al. using the LCT-epoxy polymers of Smith et al., this property would have been an inherent result of the reaction between the carboxylate-alumoxane and the LCT-epoxy polymer – *see MPEP 2112.01 II*.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the technique of reacting a carboxylate-alumoxane with an epoxy resin to form a hybrid epoxy resin, as taught by Cook et al., with the LCT-epoxy resins of Smith et al. because the teachings of Cook et al. extend to all commercially available epoxy resins, resulting in a hybrid polymer having a desired set of properties provided by the alumoxane. This

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technique is an alternative to the standard practice of adding filler to resin systems and it also avoids handling and dispersion problems of filler materials, including phase separation and agglomeration of filler in the polymer composite.

Regarding claims 12-14, the combined teachings of Smith et al. and Cook et al. are as set forth above and incorporated herein. The scope of claims 12-14 is similar to the scope of claims 1-9 and 11; however, it further contains language regarding the steps of coating and impregnating the resin onto/into an electrical insulator, wherein the electrical insulator is a mica/glass insulating tape. The base reference of Smith et al. teaches these limitations (*see column 8, line 49 through column 10, line 7; and claim 3*).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the technique of reacting a carboxylate-alumoxane with an epoxy resin to form a hybrid epoxy resin, as taught by Cook et al., with the LCT-epoxy resins of Smith et al. because the teachings of Cook et al. extend to all commercially available epoxy resins, resulting in a hybrid polymer having a desired set of properties provided by the alumoxane. This technique is *an alternative to the standard practice of adding filler to resin systems* and it also avoids handling and dispersion problems of filler materials, including phase separation and agglomeration of filler in the polymer composite.

Regarding claims 15-19, the combined teachings of Smith et al. and Cook et al. are as set forth above and incorporated herein. The scope of claims 15-19 is similar to the scope of claims 1-9 and 11; however, it further contains the following property:

- the alumoxane-LCT-epoxy polymers are substantially free of particle wetting and micro-void formation.

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The combined teachings of Smith et al. and Cook et al. are silent regarding this property of the alumoxane-LCT-epoxy polymers. However, it appears that if one skilled in the art were to apply the technique of Cook et al. using the LCT-epoxy polymers of Smith et al., this property would have been an inherent result of the reaction between the carboxylate-alumoxane and the LCT-epoxy polymer – *see MPEP 2112.01 II*.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the technique of reacting a carboxylate-alumoxane with an epoxy resin to form a hybrid epoxy resin, as taught by Cook et al., with the LCT-epoxy resins of Smith et al. because the teachings of Cook et al. extend to all commercially available epoxy resins, resulting in a hybrid polymer having a desired set of properties provided by the alumoxane. This technique is an alternative to the standard practice of adding filler to resin systems and it also avoids handling and dispersion problems of filler materials, including phase separation and agglomeration of filler in the polymer composite.

3. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US Pat. No. 5,904,984) and Cook et al. (US Pat. No. 6,369,183) in view of Stackhouse et al. (US Pat. No. 4,427,740).

Regarding claim 10, the combined teachings of Smith et al. and Cook et al. are as set forth above and incorporated herein. The combined teachings are silent regarding the addition of zinc naphthenate or chromium acetylacetonate.

Stackhouse et al. disclose an insulated electrical member adapted for high voltage-use, wherein the material is impregnated with an epoxy resin (Abstract; column 6, lines 50-56). They

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further disclose, “Typical reactive impregnating compositions comprise, for example, bisphenol A epoxy resin; acid anhydride, curing agent, such as NADIC methyl anhydride or 1-methyltetrahydrophthalic anhydride; reactive diluent, such as neopentyl diglycidyl ether or vinyl cyclohexanone dioxide; *and latent accelerator, such as chromium acetylacetonate*, to produce a low viscosity composition of about 80 cps at 25°C,” (column 6, line 67 through column 7, line 6).

The teachings of Stackhouse et al. demonstrate that chromium acetylacetonate is recognized in the art as a suitable latent accelerator for epoxy/anhydride systems used to impregnate electrical insulating materials. In light of this, it has been found that the selection of a known material based on its suitability for its intended use supports a *prima facie* obviousness determination – *see MPEP 2144.07*.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to add a latent catalyst of zinc naphthenate or chromium acetylacetonate to the combined teachings of Smith et al. and Cook et al. because Stackhouse et al. demonstrate that chromium acetylacetonate is recognized in the art as a suitable latent accelerator for epoxy/anhydride systems used to impregnate electrical insulating materials.

Response to Arguments

4. The arguments set forth in the response dated February 24, 2005 have been considered; however, they are not persuasive.

Applicants argue, “*First, one of ordinary skill in the art would not expect that the LCT resin of Smith could be used for enhanced conductivity*”. This is true when looking at the

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reference on its own; however, in light of the teachings of Cook et al., it would have been reasonable to expect that enhanced conductivity would be achieved when incorporating the epoxy resin of Smith et al. into the process/modification of Cook et al.

Applicants continue with, *“Furthermore, one of ordinary skill in the art would not have used liquid crystal thermoset resins in conjunction with Cook. The LCT resins have a much more intricate structure than the resin used in Cook. To add the large molecules of alumoxanes, in such high concentrations, to the crystalline structures of the LCT resins, one would expect the crystalline structure to be ruined.”* The basis for this argument is unclear because there is no evidence to suggest that this is the case. The concentrations of alumoxane used by Cook et al. (see: column 14, lines 17-19; Table 1: column 25, lines 55-64) are within the scope of the instant invention. These same concentrations would have been used when incorporating the epoxy resins of Smith et al.

Declaration Under 37 CFR 1.132

5. The declaration under 37 CFR 1.132 filed February 24, 2005 is insufficient to overcome the rejection of claims 1-9 based upon the prior art of record as set forth in the last Office action because:

The declaration filed on February 24, 2005 reiterates the arguments set forth in the response. In addition, the declaration states:

(6) Myself and colleagues did experiments on the effect of adding fillers , such as alumina and silica, to the LCT epoxides and noticed that we had a deleterious effect on both physical and

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electrical properties as shown by a significant drop in HDT (heat distortion temperature) and dielectric strength due to the disruption of the crystalline structure.

This may be the case; however, the combined teachings of the prior art incorporate the alumoxanes into the chemical structure of the resin as an *alternative* to the addition of fillers, such as alumina and silica. The addition filler is not an issue when combining these two teachings. Furthermore, there is no evidence on record to support this assertion.

(7) By mixing the alumoxanes of Cook with the LCT of Smith one would expect to get, and with all likelihood end up with, a ruined LCT resin that has disrupted crystalline domains and phase separation with the added alumoxanes. This disruption is crystalline structure and phase separation would result in the degradation of the high performance properties of a LCT epoxy resin.

There is no factual evidence to support these assertions. Furthermore, the mechanism taught by Cook et al. (see Figure 10) when incorporated with the LCT epoxy resins of Smith et al. would have been the same mechanism presented in the instant application on page 9 of the specification. The only difference would have been in the phenyl skeleton, which does not actively participated in the reaction.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

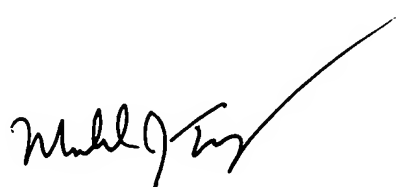
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Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is 571-272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Michael J. Feely
Primary Examiner
Art Unit 1712

May 16, 2005